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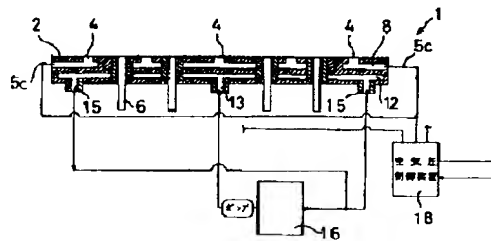
(54) SUBSTRATE SUCKING AND HOLDING DEVICE

(57) Abstract:

PROBLEM TO BE SOLVED: To release the suction without damaging a sucked substrate.

SOLUTION: A sucking and holding device 1 comprises a plate 2, a cooling device 16, an air pressure control device 18 or the like, and the plate 2 is provided with a suction port 4 and an elevating/lowering pin 6, etc. The suction hole 4 and the elevating/lowering pin 6 are alternatively arranged on the same circle on the surface of the plate, and also concentrically arranged. The suction holes on the same circle are connected by a same pumping passage 8 so that the vacuum is supplied for each pumping passage and the inert gas is sprayed. In addition, small ruggedness is formed on the surface of the plate. The suction force of the substrate to be applied to the elevating/lowering pin in peeling the substrate can be uniform, and the substrate can be peeled without generating cracks, or the like.

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(56)参考文献 特開 平4-256535 (J P, A)

特開 昭63-131535 (J P, A)

特開 平6-339830 (J P, A)

特開 昭62-72139 (J P, A)

(58)調査した分野(Int.Cl.⁶, D B名)

B23Q 3/08

(54)【発明の名称】 基板吸着保持装置

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(57)【特許請求の範囲】

【請求項1】 平面状の吸着面に吸着孔を備え、該吸着孔に供給した負圧の吸着力により基板を吸着、保持する基板吸着保持装置において、

前記吸着面に、前記基板を該吸着面に対して昇降させる昇降ピンと前記吸着孔とを交互に円状に配置し、かつ前記昇降ピンと前記吸着孔とから形成された配列円を同心円状に設け、

前記基板を吸着させる際に、前記吸着孔への負圧の供給を中心付近の吸着孔より開始させて順次外方に進行させることを特徴とする基板吸着保持装置。

【請求項2】 前記基板の吸着を解除する際に、外方に位置する前記吸着孔より吸着解除を開始し、順次中心に向けて進行させることを特徴とする請求項1に記載の基板吸着保持装置。

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【請求項3】 前記吸着面に微細な凹凸を形成したことを特徴とする請求項1又は2に記載の基板吸着保持装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、液晶ディスプレイのガラス基板等板状体を負圧により吸着保持し、又保持した基板を冷却する基板吸着保持装置に関する。

【0002】

【従来の技術】 基板吸着保持装置は、基板等を負圧によって吸着するプレートと、プレートに負圧を供給する負圧装置と、プレートに冷却液を供給する冷却液供給装置等から構成され、例えば液晶ディスプレイのガラス基板をプレート上に吸着保持し、冷却液供給装置からプレートに冷却液等を送り製造工程の途中で加熱されたガラス基板を冷却させる装置である。

【0003】従来のプレート20を図5に示す。プレート20は図5に示すように、負圧装置に連通した吸着孔4が、プレート20の中央部に楕円状に、又外周部に直線上に配置されており、更に昇降ピン6がプレート20の中央部からプレート20の対角線に沿って等間隔で配置されている。

【0004】そして、基板吸着保持装置は、前工程からハンド等によって基板が搬送されてくると昇降ピン6を上昇させて基板を支持し、ハンドが原点に復帰すると吸着孔4に負圧を供給して吸着を開始させ、昇降ピン6を下降させて基板をプレート20で吸着する。冷却液をプレート20に供給し基板が冷却されると、吸着孔4への負圧の供給を停止し、吸着孔4から不活性ガスを吹き出しながら昇降ピン6を上昇し、基板をプレート20から剥離して次工程に移すようにしていた。

【0005】又、基板等を吸着する他の技術としては、吸着面と被吸着物との間に隙間を形成するために複数の突起を吸着面の下面に設けた発明(特開平5-208389号)、吸着板の表面外周部にリブを形成し、吸着板表面から基板を剥離する場合に、リブを用いて吸着孔から吹き出した空気の開層層を基板表面と吸着板との間に形成する発明(実開平5-78491号)、吸着孔に弾性体からなるリングを取り付け、基板の損傷を防ぐ発明(実開平1-64387号)等が知られている。

【0006】

【発明が解決しようとする課題】しかしながら、従来の基板吸着保持装置においては、プレート20上に吸着孔4と昇降ピン6とを相互の位置関係を考慮することなく配列していたため、基板をプレート20の表面から剥離するため昇降ピン6を作動させた場合、個々の昇降ピン6にかかる基板の吸着力にばらつきが生じていた。すなわち、ある昇降ピン6は周囲に複数の吸着孔4が近接しているため吸着孔4による吸着力が強く、別の昇降ピン6は周囲に吸着孔4がなく吸着力がほとんど働かないという状態が生じており、昇降ピン6が基板を上昇させたとき基板に加えられる力が個々の昇降ピン6毎に異なっていた。そのため、基板の吸着を解除させる解除バランスが均一に発生せず、更に基板とプレート20の接触面が平面であるために互いの吸着力が大きく、昇降ピン6の作動によって基板の割れが発生し易くなり、稼働率、歩留りの低下等を引き起こしていた。第2の問題点としては、上記吸着技術(特開平5-208389号、実開平5-78491号、実開平1-64387号)を使用した場合には、一部の接触部分を除き、基板とプレートとの間に0.2~0.3mm程度の空間が形成されるため、基板の裏面がプレートの表面と均一に接触せず、基板を効率的に冷却できないことがある。

【0007】

【課題を解決するための手段】上記の課題を解決する手段として、本発明では基板吸着保持装置を次のように構

成した。

【0008】平面状の吸着面に吸着孔を設け、吸着孔の負圧による吸着力で基板を吸着、保持する基板吸着保持装置において、前記吸着面に吸着孔と昇降ピンとを交互に円形に配列し、更にかかる吸着孔と昇降ピンとの配列を同心円状に形成して基板吸着保持装置を構成した。このように吸着孔を同心円状に等間隔で配置することにより基板への吸着力を均等にできる。そして、吸着孔と同一円上に交互に昇降ピンを設け、又これらを同心円状に配置することにより、バランスよく基板を昇降ピンで押し上げることが可能になり、これにより基板に加えられる不均一な力を最小限にして基板の損傷等を防止することができる。

【0009】また、前記同心円に配置された吸着孔ごとにそれぞれ吸排気制御が可能のように吸着孔の吸排気配管を少なくとも2系統備えて基板吸着保持装置を構成した。このようにすると、中心から最外円に向けてあるいは最外円から中心に向ける等同一円上に配置された吸着孔ごとに吸排気を制御でき、短時間で吸着解除及び不活性ガスの吹き付けができ、基板への負荷の不均一を緩和することが可能となる。

【0010】更に、吸着面の表面に微小な凹凸を形成して基板吸着保持装置を構成した。このように表面に凹凸を形成すると、吸着面と基板の間への不活性ガスの流れ込みや、昇降ピンにて基板を持ち上げる際の大気開放を円滑にすることができる。又、凹凸を微小にしていることから冷却効率が低下することはなく、しかも基板の全面に均一に接触することから基板の冷却を均等にすることができる。

【0011】

【発明の実施の形態】本発明にかかる基板吸着保持装置の実施の形態を図面を参照して説明する。

【0012】図1に、基板吸着保持装置の斜視図を示す。図1において、2はプレートであり、プレート2の表面には吸着孔4、及び昇降ピン6等が備えられ、10はプレート2に負圧によって吸着されるガラス基板である。

【0013】まず、吸着保持装置1の構成を説明する。吸着保持装置1は、図2に示すようにプレート2と、プレート2に冷却液を送る冷却装置16と、空気圧制御装置18等からなり、プレート2には、吸着孔4、昇降ピン6、および吸排気通路8、冷却液通路12が設けてある。

【0014】又、プレート2の表面には、絶縁処理を行った上で微細で均一な凹凸が形成されており、形成されている凹凸は基板10を表面に吸着するにあたり支障をきたさない高さであり、具体的には10~100 μ mの範囲となっている。

【0015】吸着孔4は、図3に示すようにプレート2の中央を中心とした同心円上に所定の間隔に配置されて

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おり、吸着孔4の高さはプレート2の表面と同等もしくは若干低めである。又同一の円上に配置されている吸着孔4は、図4に示すように同一系統の吸排気通路8a、8b、8cに連通し、各吸排気通路8a等はそれぞれ吸排気配管5a、5b、5cを介して空気圧制御装置18に接続している。図3、図4において、昇降ピン6は黒丸で表し、同一系統の吸着孔4は、同一の模様で表した。

【0016】空気圧制御装置18は、図示しない圧力ポンプと、真空ポンプに接続し、圧力ポンプからの高圧空気もしくは真空ポンプによる負圧を、内部に備えた切り換え機構によって切り換えて、吸排気配管5a、5b、5cを通して任意に各吸排気通路8a、8b、8cに供給する装置である。

【0017】昇降ピン6は、図示しない駆動機構の作動により基板2より突出後退し、吸着孔4と同じ円上に吸着孔4と交互に、かつ等しい間隔をあけて配置してある。

【0018】冷却液通路12は、プレート2の内部に平面状にほぼ全面にわたり設けてあり、プレート2の中央に冷却液通路12の入水口13が、又プレート2の角部4箇所にそれぞれ出水口15が設けられている。入水口13には、冷却装置16からの送水管が接続してあり、又出水口15には冷却装置16に戻る戻り管が接続してあり、入水口13から冷却液通路12内に送水された冷却液は内部を四方に広がり基板10を内部から冷却しながら、四隅に設けられた出水口15から冷却装置16に戻るようになっている。

【0019】次に、吸着保持装置1の動作を説明する。

【0020】まずプレート2の昇降ピン6は下降しており、前工程から基板10がハンド（図示せず）によってプレート2上に運ばれてくると、昇降ピン6が上昇し、基板10をハンドから持ちあげる。ハンドが基板10から離れ原点に復帰すると、昇降ピン6が下降し、基板10を吸着する。その際、まず吸排気配管5aに負圧が供給され、最も内側の吸着孔4aが基板10を吸着する。そして昇降ピン6が完全に下降するとその2～5秒後にその他の吸排気配管5b、5cに順次負圧が供給され、内側の吸着孔4bから吸着孔4cへと吸着を順次行う。これにより基板10が最も収縮するプレート2の外周部の吸着孔4cの周辺の摩擦力を低減させ、摩擦及び静電気による吸着力を減少させることができる。

【0021】基板10を吸着させたなら、吸着した状態で冷却液通路12に冷却装置から冷却液を導水させて基板10を冷却する。基板10は、基板10がプレート2に吸着によって密着していることから熱の伝達効率が高く、効率よくかつ均等に冷却できる。

【0022】冷却が終了したなら吸着解除を行う。吸着解除は、まず吸着孔4への負圧の供給を停止し、吸着孔4に不活性ガスを供給する。吸着孔4a、4b、4cか

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ら不活性ガスを吹き出す際には、負圧の供給順序とは逆にし最も外側の吸着孔4cから順次内側の吸排気配管5b、5aで制御される吸着孔4b、4aに向って吸着解除及び不活性ガスの吹き出しを行う。これは最も吸着力が大きい外周部から大気開放し基板割れを防止することを目的とする。最も内側の吸着孔4aの吸着を解除した後に昇降ピン6を上昇させて、基板10をプレート2から剥離する。このときは吸着解除及び不活性ガスを吹き出した1～2秒後にS字制御を行ったモータ駆動で昇降ピン6を押し上げることが望ましい。又、不活性ガスはイオナイザーを通して吸着孔4より噴出することが望ましい。

【0023】このように、上記吸着保持装置1によれば、昇降ピン6から基板10に不均一で、無理な力が加えられることがなく、基板10の吸着解除をすることができるので、基板10の損傷が発生せず、歩留りの高い、生産性の高い基板吸着保持装置を提供することができる。

【0024】

【発明の効果】本発明の基板吸着保持装置によれば、吸着孔と昇降ピンとを交互に円状に配置し、更にその吸着孔と昇降ピンとを同心円状に配置したことにより、プレートから基板を剥離する際の基板割れを大幅に減少することが可能となる。

【0025】その理由としては、均等に配置された昇降ピンは、基板を剥離する際に各吸着孔に対して同等の吸着力により接触し、昇降ピンを押し上げる際に吸着力の大きい吸着孔付近を左右から同等の力で押し上げることが可能となり、これにより基板に加わる力を均等にすることができからである。

【0026】また、プレート表面に微細な凹凸を形成したことにより、不活性ガスを吸着孔から吹き出させた際にガスが基板との接触面の間に広く拡散しやすくなり、又基板を剥離させる際基板との接触面の間に大気が入り易くなり、より基板の剥離を容易にできる。

【図面の簡単な説明】

【図1】本発明にかかる吸着保持装置の一実施形態を示す斜視図である。

【図2】図1に示した吸着保持装置の断面図である。

【図3】本発明にかかるプレートを示す平面図である。

【図4】本発明にかかるプレートを示す平面図である。

【図5】従来のプレートを示す平面図である。

【符号の説明】

1 吸着保持装置

2、20 プレート

4a、4b、4c 吸着孔

5a、5b、5c 吸排気配管

6 昇降ピン

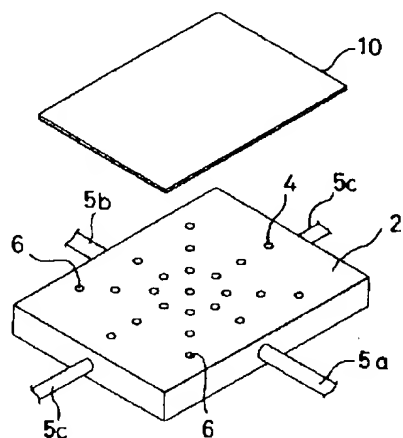
8a、8b、8c 吸排気通路

10 基板

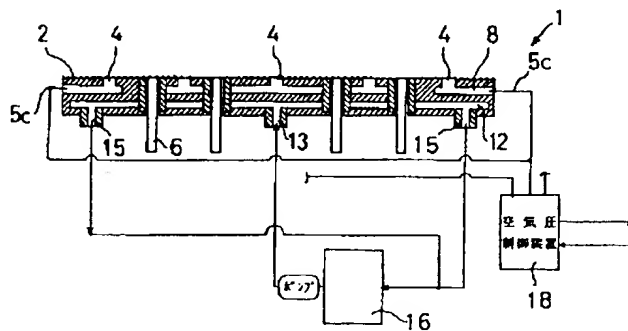
- 12 冷却液通路
13 入水口
15 出水口

- 16 冷却装置
18 空气压制御装置

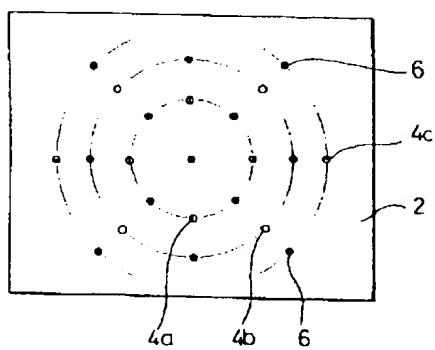
【図1】



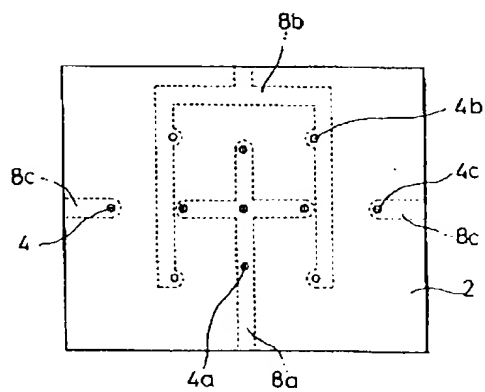
【図2】



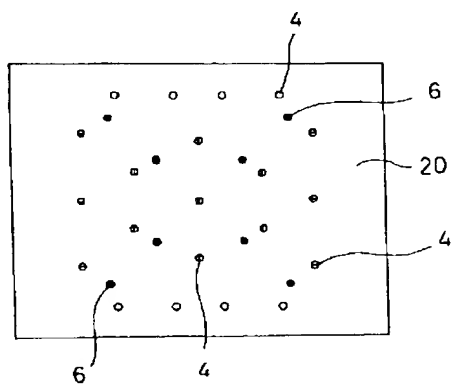
【図3】



【図4】



【図5】



1. JP,2991110,B

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CLAIMS

(57) [Claim(s)]

[Claim 1] In the substrate adsorption supporting structure which adsorbs a substrate and holds it by the adsorption power of the negative pressure supplied to the hole the adsorption side of a plane -- adsorption -- a hole -- having -- this adsorption -- A hole is arranged in the shape of a circle by turns. the rise-and-fall pin and the aforementioned adsorption which make the aforementioned adsorption side go up and down the aforementioned substrate to this adsorption side -- and the aforementioned rise-and-fall pin and the aforementioned adsorption -- the time of preparing the array circle formed from the hole in the shape of a concentric circle, and making the aforementioned substrate adsorb -- the aforementioned adsorption -- supply of the negative pressure to a hole -- the adsorption near a center -- the substrate adsorption supporting structure characterized by making it start from a hole and advancing the method of outside one by one

[Claim 2] the aforementioned adsorption located in the method of outside in case adsorption of the aforementioned substrate is canceled -- the substrate adsorption supporting structure according to claim 1 characterized by starting adsorption release and making it go on towards a center one by one from a hole

[Claim 3] The substrate adsorption supporting structure according to claim 1 or 2 characterized by forming detailed irregularity in the aforementioned adsorption side.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the substrate adsorption supporting structure which cools the substrate which carried out adsorption maintenance with negative pressure, and held plates, such as a glass substrate of a liquid crystal display.

[0002]

[Description of the Prior Art] The substrate adsorption supporting structure is equipment which makes the glass substrate which consisted of a plate which adsorbs a substrate etc. with negative pressure, negative pressure equipment which supplies negative pressure to a plate, a coolant feeder which supplies the coolant to a plate, for example, carried out adsorption maintenance of the glass substrate of a liquid crystal display on the plate, sent the coolant etc. to the plate from the coolant feeder; and was heated in the middle of the manufacturing process cool.

[0003] The conventional plate 20 is shown in drawing 5. the adsorption which was open for free passage to negative pressure equipment as a plate 20 was shown in drawing 5 -- a hole 4 -- the center section of the plate 20 -- the shape of an ellipse -- moreover, it is arranged on the straight line at the periphery section, and the rise-and-fall pin 6 is further arranged at equal intervals along with the diagonal line of a plate 20 from the center section of the plate 20

[0004] and -- if the substrate adsorption supporting structure will raise the rise-and-fall pin 6, and will support a substrate, if a substrate is conveyed by the hand etc. from a last process, and a hand returns to a zero -- adsorption -- supply negative pressure to a hole 4, adsorption is made to start, the rise-and-fall pin 6 is dropped, and a substrate is adsorbed on a plate 20 if the coolant is supplied to a plate 20 and a substrate is cooled -- adsorption -- supply of the negative pressure to a hole 4 -- stopping -- adsorption -- the rise-and-fall pin 6 is gone up blowing off inert gas from a hole 4, and it exfoliates from a plate 20 and was made to move a substrate to the following process

[0005] Invention (JP,5-208389,A) moreover, as other technology of adsorbing a substrate etc., in order to form a crevice between an adsorption side and the adsorbate-ed, two or more salients were prepared in the inferior surface of tongue which is an adsorption side -- When forming a rib in the surface periphery section of a fixing disc and exfoliating a substrate from a fixing disc front face a rib -- using -- adsorption -- invention (JP,5-78491,U) which forms the expansion layer of the air which blew off from the hole between a substrate front face and a fixing disc, and adsorption -- the O ring which becomes a hole from an elastic body is attached, and invention (JP,1-64387,U) which prevents the injury on a substrate is known

[0006]

[Problem(s) to be Solved by the Invention] however, the conventional substrate adsorption supporting structure -- setting -- a plate 20 top -- adsorption -- since the hole 4 and the rise-and-fall pin 6 were arranged without taking mutual physical relationship into consideration, and a substrate is exfoliated from the front face of a plate 20, when operating the rise-and-fall pin 6, dispersion had arisen in the adsorption power of the substrate concerning each rise-and-fall pin 6 namely, adsorption of plurality [pin / rise-and-fall / 6 / a certain / circumference] -- since the hole 4 is close -- adsorption -- rise-and-fall pin 6 strong [the adsorption power by the hole 4], and another -- the circumference -- adsorption -- there is no hole 4, the state of saying that an adsorption power hardly works had arisen, and when the rise-and-fall pin 6 raised a substrate, the force applied to a substrate differed each rise-and-fall pin 6 of every Therefore, the release balance which makes adsorption of a substrate cancel did not occur uniformly, but since the contact surface of a substrate and a plate 20 was a flat surface further, the mutual adsorption power was large, by the operation of the rise-and-fall pin 6, it becomes easy to generate the crack of a substrate and the fall of availability and the yield etc. was caused. Since about 0.2-0.3mm space is formed between a substrate and a plate except for some contact portions as the 2nd trouble when the above-mentioned adsorption technology (JP,5-208389,A, JP,5-78491,U, JP,1-64387,U) is used, the rear face of a substrate may not contact the front face and homogeneity of a plate, and may

be unable to cool a substrate efficiently.

[0007]

[Means for Solving the Problem] As a means to solve the above-mentioned technical problem, the substrate adsorption supporting structure consisted of this inventions as follows.

[0008] the adsorption side of a plane -- adsorption -- a hole -- preparing -- adsorption -- the substrate adsorption supporting structure which adsorbs a substrate and holds it by the adsorption power by the negative pressure of a hole -- setting -- the aforementioned adsorption side -- adsorption -- a hole and a rise-and-fall pin -- alternation -- circular -- arranging -- further -- this adsorption -- the array of a hole and a rise-and-fall pin was formed in the shape of a concentric circle, and the substrate adsorption supporting structure was constituted thus, adsorption -- the adsorption power to a substrate can be equalized by arranging a hole at equal intervals in the shape of a concentric circle and adsorption -- by preparing a rise-and-fall pin by turns on the same circle as a hole, and arranging these in the shape of a concentric circle, it can become possible to push up a substrate with sufficient balance by the rise-and-fall pin, the uneven force applied to a substrate by this can be made into the minimum, and the injury on a substrate etc. can be prevented

[0009] moreover, the adsorption arranged at the aforementioned concentric circle -- pumping control is possible respectively for every hole -- as -- adsorption -- it had at least two pumping piping of a hole, and the substrate adsorption supporting structure was constituted thus, if it carries out, it has turned to the outermost circle from the center -- it is -- the adsorption arranged on the same circle, such as turning to a center from the outermost circle, -- pumping can be controlled for every hole, blasting of adsorption release and inert gas can be performed for a short time, and it becomes possible to ease the ununiformity of the load to a substrate

[0010] Furthermore, minute irregularity was formed in the front face of an adsorption side, and the substrate adsorption supporting structure was constituted. Thus, if irregularity is formed in a front face, air opening at the time of raising a substrate by the influx and rise-and-fall pin of inert gas of between an adsorption side and substrates can be made smooth. Moreover, since cooling efficiency does not fall since irregularity is made minute, and it moreover contacts uniformly all over a substrate, cooling of a substrate can be equalized.

[0011]

[Embodiments of the Invention] The gestalt of operation of the substrate adsorption supporting structure concerning this invention is explained with reference to a drawing.

[0012] The perspective diagram of the substrate adsorption supporting structure is shown in drawing 1 . drawing 1 -- setting -- 2 -- a plate -- it is -- the front face of a plate 2 -- adsorption -- having a hole 4 and rise-and-fall pin 6 grade, 10 is a glass substrate by which a plate 2 is adsorbed with negative pressure

[0013] First, the composition of the adsorption supporting structure 1 is explained. from the cooling system 16 with which the adsorption supporting structure 1 sends the coolant to a plate 2 and a plate 2 as shown in drawing 2 , and pneumatic-control equipment 18 grade -- becoming -- a plate 2 -- adsorption -- the hole 4, the rise-and-fall pin 6 and the pumping path 8, and the coolant path 12 are formed

[0014] Moreover, the irregularity which detailed and uniform irregularity is formed in the front face of a plate 2 after performing insulating processing, and is formed is height which does not cause trouble in adsorbing a substrate 10 on a front face, and specifically serves as the range of 10-100 micrometers.

[0015] adsorption -- a hole 4 is arranged at a predetermined interval on the concentric circle centering on the center of a plate 2, as shown in drawing 3 -- having -- **** -- adsorption -- the height of a hole 4 is lowered on a par with the front face of a plate 2, and a little, and it comes out of it moreover, the adsorption arranged on the same circle -- the hole 4 was open for free passage to the pumping paths 8a, 8b, and 8c of the same system, as shown in drawing 4 , and it has connected each pumping path 8a etc. to pneumatic-control equipment 18 through the pumping piping 5a, 5b, and 5c, respectively drawing 3 and drawing 4 -- setting -- the rise-and-fall pin 6 -- a black dot -- expressing -- adsorption of the same system -- the hole 4 expressed with the same pattern

[0016] Pneumatic-control equipment 18 is the pressure pump which is not illustrated and equipment which connected with the vacuum pump and equipped the interior with the negative pressure by the high-pressure air or the vacuum pump from a pressure pump and which switches, switches according to a mechanism and is arbitrarily supplied to each pumping paths 8a, 8b, and 8c through the pumping piping 5a, 5b, and 5c.

[0017] the operation of the drive which does not illustrate the rise-and-fall pin 6 -- a substrate 2 -- protrusion retreat -- carrying out -- adsorption -- the same circle top as a hole 4 -- adsorption -- a hole 4 and alternation -- and an equal interval is opened and it arranges

[0018] The coolant path 12 is mostly established in the interior of a plate 2 over the whole surface at the plane, the suicide-by-drowning mouth 13 of the coolant path 12 is formed in the center of a plate 2, and the flood mouth 15 is formed in four corners of a plate 2 again, respectively. The water pipe from a cooling system 16 is connected to the

suicide-by-drowning mouth 13, and the return pipe which returns to a cooling system 16 is connected to the flood mouth 15, and the coolant to which water was supplied in the coolant path 12 from the suicide-by-drowning mouth 13 returns from the flood mouth 15 prepared in four corners to a cooling system 16, spreading the interior on all sides and cooling a substrate 10 from the interior.

[0019] Next, operation of the adsorption supporting structure 1 is explained.

[0020] First, the rise-and-fall pin 6 will go up, and the rise-and-fall pin 6 of a plate 2 will raise a substrate 10 from a hand, if it is descending and a substrate 10 is carried by the hand (not shown) on a plate 2 from a last process. If a hand separates from a substrate 10 and returns to a zero, the rise-and-fall pin 6 will descend and a substrate 10 will be adsorbed. negative pressure supplies pumping piping 5a first in that case -- having -- most -- inside adsorption -- a hole -- 4a adsorbs a substrate 10 and if the rise-and-fall pin 6 descends completely, negative pressure will supply the other pumping piping 5b and 5c one by one after the 2 - 5 seconds -- having -- inside adsorption -- the adsorption from hole 4b -- a hole -- it sticks to 4c one by one adsorption of the periphery section of the plate 2 which a substrate 10 contracts most by this -- a hole -- the surrounding frictional force of 4c can be reduced and the adsorption power by friction and static electricity can be decreased

[0021] If a substrate 10 is made to adsorb, the coolant will be made to conduct water to the coolant path 12 from a cooling system in the state where it adsorbed, and a substrate 10 will be cooled. Since the substrate 10 has stuck the substrate 10 to the plate 2 by adsorption, its transmission efficiency of heat is high and can cool it efficiently and equally.

[0022] Adsorption release will be performed if cooling is completed. adsorption release -- first -- adsorption -- supply of the negative pressure to a hole 4 -- stopping -- adsorption -- inert gas is supplied to a hole 4 adsorption -- the time of blowing off inert gas from Holes 4a, 4b, and 4c -- the supply sequence of negative pressure -- reverse -- carrying out -- most -- outside adsorption -- the adsorption controlled by the inside pumping piping 5b and 5a one by one from hole 4c -- the blowdown of adsorption release and inert gas is performed toward Holes 4b and 4a This aims at carrying out air opening from the periphery section with the largest adsorption power, and preventing a substrate crack. most -- inside adsorption -- a hole -- after canceling adsorption of 4a, the rise-and-fall pin 6 is raised, and a substrate 10 is exfoliated from a plate 2 1 - 2 seconds after blowing off adsorption release and inert gas at this time, it is desirable to push up the rise-and-fall pin 6 by motorised [which performed S-character control]. moreover, inert gas -- lo -- NAIZA -- letting it pass -- adsorption -- spouting from a hole 4 is desirable

[0023] Thus, according to the above-mentioned adsorption supporting structure 1, it is uneven from the rise-and-fall pin 6 to a substrate 10, and since the impossible force is not applied and adsorption release of a substrate 10 can be carried out, the injury on a substrate 10 does not occur but the high substrate adsorption supporting structure of productivity with the high yield can be offered.

[0024] [Effect of the Invention] according to the substrate adsorption supporting structure of this invention -- adsorption -- a hole and a rise-and-fall pin -- alternation -- the shape of a circle -- arranging -- further -- the adsorption -- it becomes possible from a plate by having arranged the hole and the rise-and-fall pin in the shape of a concentric circle to decrease sharply the substrate crack at the time of exfoliating a substrate

[0025] the time of the rise-and-fall pin arranged equally exfoliating a substrate as the reason -- each adsorption -- the time of contacting by the equivalent adsorption power to a hole, and pushing up a rise-and-fall pin -- large adsorption of an adsorption power -- a hole -- it is because the force in which become possible to push up the neighborhood by the equivalent force from right and left, and this joins a substrate can be equalized

[0026] moreover, the thing in which detailed irregularity was formed on the plate front face -- inert gas -- adsorption -- the time of making it blow off from a hole -- gas -- between the contact surfaces with a substrate -- large -- being spread -- being easy -- moreover, the time of making a substrate exfoliate -- between the contact surfaces with a substrate -- the atmosphere -- flowing -- being easy -- ablation of a substrate can be made easy more

[Translation done.]

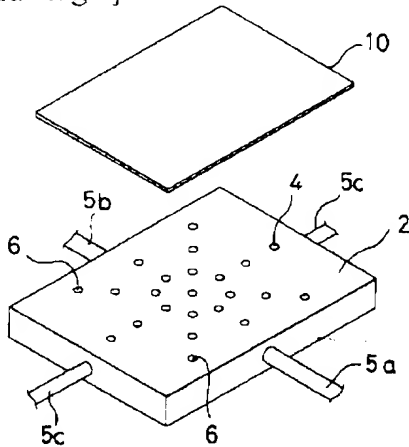
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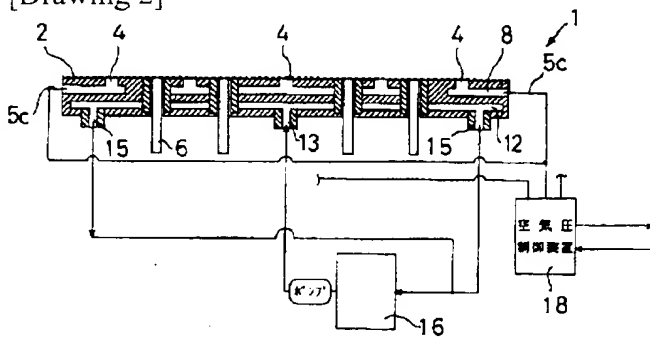
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DRAWINGS

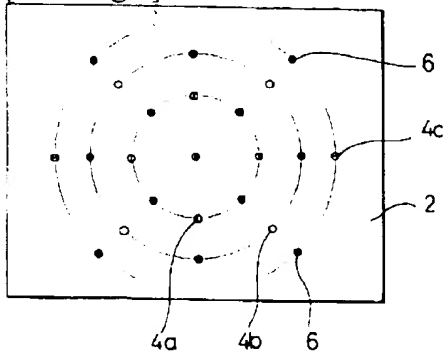
[Drawing 1]



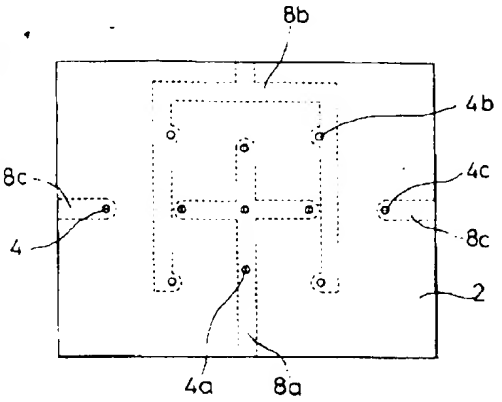
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Drawing 5]

